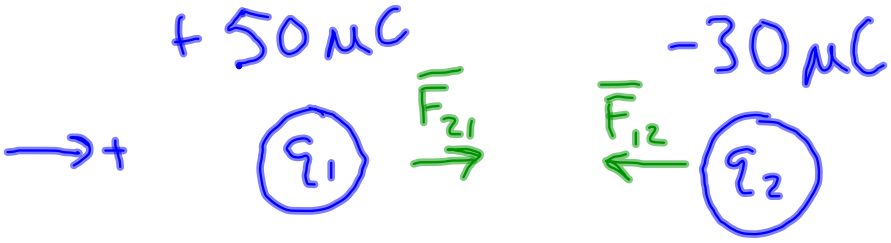
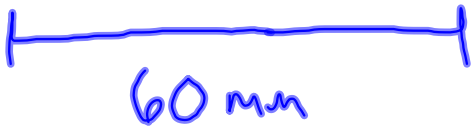
HW: p. 566: 1, 3

p. 568: 2

Two charged particles are brought near to each other. Charge 1 has a value of 50 microC (50E-6 C), charge 2 has a value of -30 microC (30E-6), and they are separated by 60 mm. What is the force that each exerts on the other?

$\mu$ = micro = $10^{-6}$ $\Rightarrow$ microC = $\mu$C



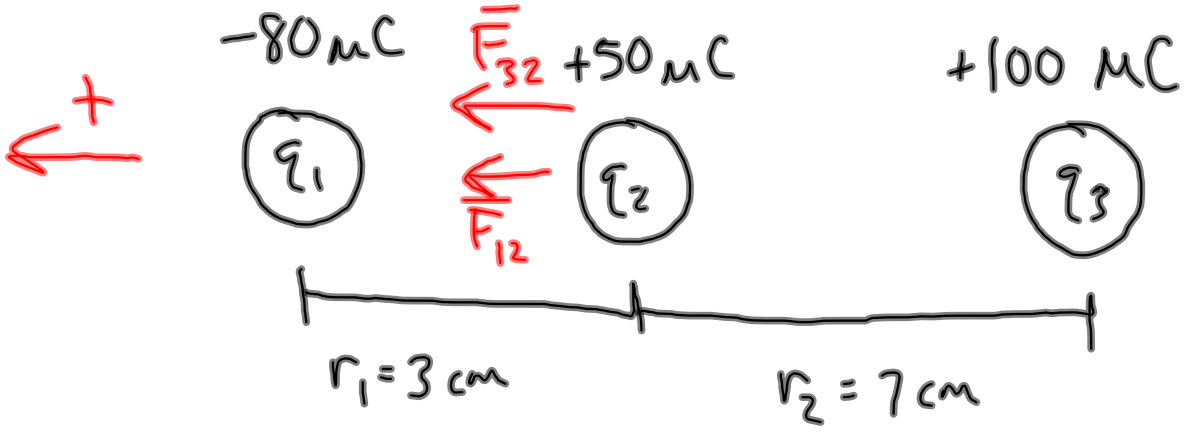




$$\vec{F}_{21} = + \frac{k|q_1||q_2|}{r^2}$$ ← direction; magnitude

$$= + \frac{(8.99E9\ N\cdot m^2/C^2)(50E\text{-}6\ C)(30E\text{-}6\ C)}{(60E\text{-}3\ m)^2}$$

$$= +375\ N$$

Three charges are arranged in a line. Charge 1 is at the origin and has a value of -80 microC, charge 2 is at +3 cm and has a value of +50 microC, and charge 3 is at +10 cm and has a value of +100 microC. What is the net force (magnitude and direction) that acts on charge 2?



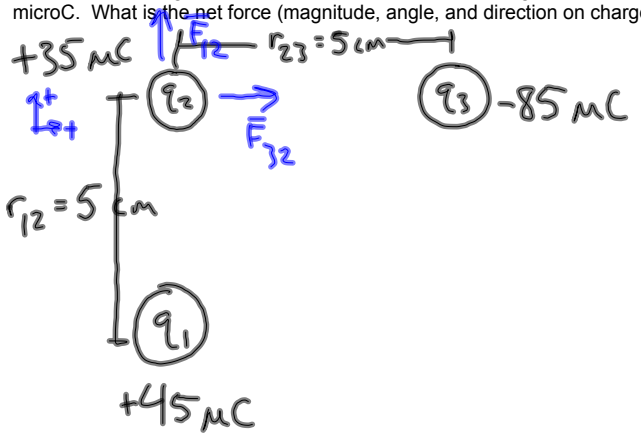

$$\Sigma \bar{F} = \bar{F}_{12} + \bar{F}_{32}$$

$$= +\frac{k|q_1||q_2|}{r_1^2} + \frac{k|q_3||q_2|}{r_2^2}$$

$$= \frac{(8.99E9\ N\cdot m^2/C^2)(80E-6\ C)(50E-6\ C)}{(.03\ m)^2} + \frac{(8.99E9\ N\cdot m^2/C^2)(50E-6\ C)(100E-6\ C)}{(.07\ m)^2}$$

$$= +49200\ N$$

Three charges are arranged in a right triangle (see picture below). Charge 1 has a value of 45 microC, charge 2 has a value of 35 microC, and charge 3 has a value of -85 microC. What is the net force (magnitude, angle, and direction on charge 2?




$$\Sigma \vec{F}_x = \vec{F}_{12x}^{\,\nearrow\,0} + \vec{F}_{32x}$$

$$= \frac{k|q_3||q_2|}{r_{23}^2}$$

$$= \frac{(8.99E9\ N\cdot m^2/C^2)(85E\text{-}6\ C)(35E\text{-}6\ C)}{(.05\ m)^2}$$

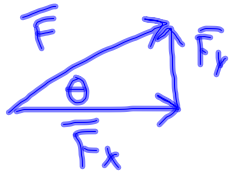
$$= 10698\ N$$

$$\Sigma \vec{F}_y = \vec{F}_{12y} + \vec{F}_{32y}^{\,\nearrow\,0}$$

$$= \frac{k|q_1||q_2|}{r_{12}^2}$$

$$= \frac{(8.99E9\ N\cdot m^2/C^2)(45E\text{-}6\ C)(35E\text{-}6\ C)}{(.05\ m)^2}$$

$$= 5664\ N$$



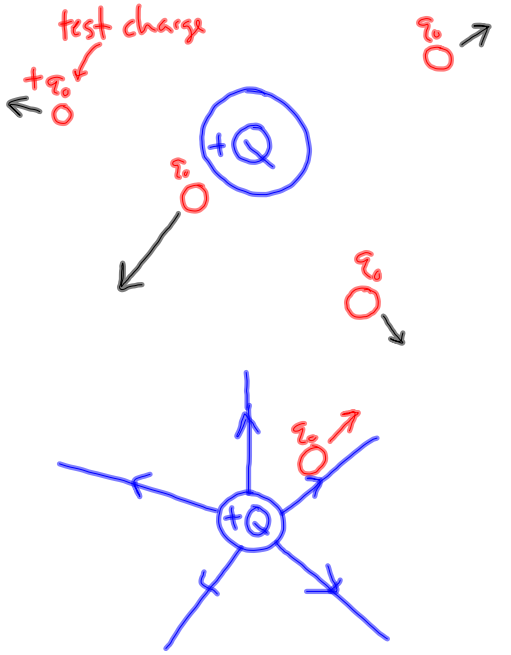

$F = 12105\ N$

$\theta = 27.9°$

N of E

# Electric Fields:

- Around every charged object there exist an electric field.




- to calculate electric field

$$\overline{E} = \frac{\overline{F}}{q_0}$$

$\overline{F}$ → electric force

$q_0$ → test charge

↳ electric field

$$\overline{E} = \frac{\overline{F}}{q_0} = \frac{\frac{kq_0Q}{r^2}}{\frac{q_0}{1}} = \frac{kQ}{r^2}$$

- if we want to calculate electric field at a point,

$$\overline{E} = \frac{k|q|}{r^2}$$ for magnitude

direction comes from +/- of charge and the configuration

## Electric field lines:

- lines never overlap
- we can draw an infinite number, but the minimum is 3.
- for + charge, arrows point outwards
  for − charge, arrows point inwards